

Roger Hart, *Imagined Civilizations: China, the West, and Their First Encounter*, Baltimore: Johns Hopkins University Press, 2013, x, 374 pp.

H. Floris Cohen

[Professor of Comparative History of Science, Humanities Department, Utrecht University; editor of *Isis*, quarterly journal of the History of Science Society; author of several books on the how and the why of the rise of modern science in 17th century Europe. Contact: h.f.cohen@uu.nl]

A disclaimer first: This is quite a late review, and I alone am responsible for the delay, for which I offer my apologies to the author, the journal editor, and the publisher alike.

Hart's book is in effect, albeit not quite in composition, made up of two portions. The larger portion is chiefly methodological and historiographical, the other one mostly empirical in the sense of describing and seeking to explain a range of events closely connected to what the book's subtitle announces as its principal theme: 'the first encounter between China and the West'. By this is centrally meant the translation, completed in 1607 by Father Matteo Ricci SJ and the Ming mandarin Xu Guangqi 徐光啓 together, of the first six books of Euclid's *Elements* – what kind of translation this was and, above all, what their joint effort signified in terms of the history of Chinese mathematics under the Ming dynasty.

I shall now first dwell briefly on the book's empirical portion, which gives me occasion for my second disclaimer: I am not a sinologist but a historian of science given to cross-cultural comparison, and it is surely in that capacity that I have been invited to review the present book. So my area of competence is confined in the main to the book's more theory-filled portions. With its empirical portion I can responsibly deal only to the extent of simply outlining its principal findings for the reader's benefit. This is followed by more critical glances at the how and why of the rather idiosyncratic selection of pertinent events made by the author, and at the extent to which the interpretation thereof can really be said to underwrite the hugely ambitious claims made in the book's methodological / historiographical pages.

The book's empirical portion, then, has two main subjects. One is the exposition and interpretation of a range of mathematical treatises of the Ming period printed prior to the appearance of the Euclid translation. The other is several early memorials written by its Chinese co-translator, Xu Guangqi, for the benefit of the last Ming emperor, and allegedly neglected by all previous historians.

As to the former subject, those Ming treatises, the point of their treatment in the book is twofold. Roger Hart is originally, and still quite

visibly so, a philosopher, who later turned to Ming mathematics and wrote a book about it. In the summaries that he renders here, he is concerned to show that what underlies these wholly abstract, recipe-like exercises in what is now known as linear algebra is a practice, largely hidden from sight yet very widely-spread at the time and carried out as an activity in the streets and the marketplaces of China's towns, of everyday calculations performed with great agility by means of counting rods. *Fangcheng* 方程 is the name of this manner of posing certain non-trivial arithmetical problems and almost instantly resolving them by means of manipulations with those rods, on the possible material remnants of which Hart is curiously silent. In other words, Hart wants us to regard these Ming treatises as the admittedly rare superstructures of a flourishing routine activity discernible (but how exactly?) underneath the surface of those abstract disquisitions. According to Florence Hsia's review in the September 2015 issue of *Isis* (p. 713-716), it may well be that here is where the most enduringly valuable contribution to scholarship of Hart's book is situated.

On having demonstrated in this manner at least to his own satisfaction that Ming mathematics never underwent the steep decline often attributed to the period, Hart is ready for his second empirical point, to wit, that Xu Guangqi and other allegedly Christian converts falsely invoked the alleged decline in order to present Euclid's *Elements* as precisely what mathematics was in need of to usher in a renewed flourishing period, not only for mathematics but for empirical science as well. According to Hart, the conceit of these mandarins culminated in their managing, at the service of their wrong-headed argument, to "purloin" results of *fangcheng* while hiding from sight where they had found these. It is at this point that Hart invokes some early memorials by Xu Guangqi to show that he was really a very poor mathematician who, *utterly unlike how he has been portrayed in every earlier historical account of the period*, was actually given to perversely denouncing a significant portion of China's past for the benefit of his own career and his own political purposes.

The clause just italicized may serve as a bridge to the second, more spacious portion of the present review, which from here on consists of a critical account of the relentless dichotomization readily apparent in the methodological and historiographical disquisitions with which Hart's books opens and closes, not to mention the ongoing reiteration of their basic thrust throughout the book ("I shall be arguing that..."; "I argue here that..."; "I have argued/demonstrated that ..."). It is hardly a caricature to introduce the dichotomy that governs not only the very setup but also the selection of topics of the entire book thus (and I say it in my own, not Hart's words): all previous historiography of the role of science in the Jesuit mission under the late Ming and the early Qing has been marked by an utterly obsolete, profoundly a-historical, really essentialist and teleological

not to say hagiographical point of view that ultimately stems from a hopelessly reified conception of ‘civilizations’ as if these were real entities rather than just imagined concepts at the service of historical explanation. Indeed, throughout the book Hart sets himself up as the man single-handedly to minister the cures for all these grave defects. How he came to those cures is the subject of the conversion story, related at great, self-indulging length, with which he opens the book. They come down to a prescription not to employ any other concepts than those handled by the historical actors themselves, at the service of a truly historicized account of the past, in particular the past as being allegedly considered here for the first time from the Chinese point of view rather than that of the early Jesuits and their infamous crony, Xu Guangqi. Again, I am overstating slightly, but really no more than slightly, the gist of the author’s unceasing hammering on these very points.

What we have here, then, is a philosopher’s admonition to us historians finally to cease treating history as if the past were set on its way toward some pre-established goal, and instead to take historical context properly into account. Let me readily admit that it is precisely Hart’s stridently condescending me-against-all-you-dumb-historians rhetoric that has made me progressively more annoyed with a book I once began to read with high expectations. Even apart from the fact that few if any serious historians of science still approach history in a genuinely teleological manner at all, Hart’s admonition invites the question to what extent it is justified in the empirical portion of his book by any real, rather than just rhetorically attained, enhancement of our understanding of the episode. Drawing on my own expertise and my own reading, I shall now complete this review by subjecting Roger Hart’s book to four distinct test-cases. One concerns musical theory in a mathematical setting – the calculation of equal temperament written down c. 1604 by Zhu Zaiyu 朱載堉 (1536-1611). The next is the vexed question, the scholarly resolution of which has been pioneered by Joseph Needham, of how to deal in a historically responsible manner with the sudden reappearance in a given civilization of some discovery or invention made far earlier in a different one. Then I treat, succinctly and in the most impartial manner that I can muster, what Roger Hart has preferred to ignore in my own work of 1994 and 2010 regarding the making of viable comparisons between the history of science in China and in ancient Greece as a solid foundation for answering ‘Needham’s question’ of why modern science arose in Europe rather than elsewhere. Finally, and most importantly, I shall devote some well-deserved space to comparing Peter Engelfriet’s 1998 book *Euclid in China* with Hart’s book of 2013.

Hart’s brief, mathematics-centered treatment of some musical theory first. The advanced arithmetic that, in Zhu Zaiyu’s expert hands, produced

the fractions for equal temperament in far more accurate detail than was attained at the time in Europe, turns out to be interesting indeed—for a historian of the science of music in its European setting these are surely revealing passages. But what about the historical context in which these fractions made their appearance? For the student of European thinking about matters of tuning and temperament, the equal variety fits in well enough with a specific developmental line of thought about music in the European tradition expressed in the Pythagoras-inspired idea of cosmic harmony.¹ But in what specific context may Zhu Zaiyu's calculation of the same temperament have come about? After all, there is a huge difference between Chinese pentatonic music and the European tonal system, based as it is instead on seven white keys per octave on the piano (to give, for ease's sake, an utterly anachronistic definition). So on finding in Roger Hart an author not only discussing Zhu Zaiyu's refined calculation of equal temperament but also loudly declaring himself in favor of a contextual approach to the history of science I looked forward with great anticipation to finally learning how the calculation fitted in with a pentatonic scale system. Was I in for disappointment! For context we get served up nothing but the well-known, close connection in the Chinese tradition between music and ritual. Thus, Hart simply leaves that portion of the relevant context that rests in the most basic musical question, namely, what notes to make music with, out of consideration entirely, naïvely speaking of "the musical scale" (p. 122) as if its indeterminacy were not the central fact of music making the entire world over. If this is what the writing of contextual history in faithful accordance with Hart's prescriptions comes down to ...

An even more striking absence of really indispensable context concerns a far-reaching claim made by Hart about the similarity that he notes between Leonardo Fibonacci da Pisa's *Liber Abaci* (1202) and the *fangcheng* practice with counting rods that he posits to underlie those Ming treatises in linear algebra. His straightforward claim is that *similarity* allows no other explanation than direct or indirect *adoption*; in other words, that Leonardo must have picked up the computing methods he describes in his booklet from those earlier Chinese practices. *Must* have indeed, for Hart does not take the trouble to produce even one shred of empirical evidence for any tangible route of transmission at all. Practice is just tacitly taken to spread more or less everywhere and to do so without leaving written traces—two presuppositions that conveniently absolve the historian from seeking any empirical evidence at all for his wide-ranging claims. Not even Joseph Needham, in his convoluted argument about whose shoulders the burden

¹ Prins & Cohen (in press), *passim*.

of proof in such a case should properly be placed upon, did make things quite so easy for himself as, half a century later, Roger Hart does.²

In my *The Scientific Revolution. A Historiographical Inquiry* of 1994 I have discussed at some length the question of where in the complex issue of transcultural transmission of knowledge properly to situate the burden of proof. I did so as part of an over a hundred pages-long discussion of an even larger issue—the historiographical vicissitudes of ‘Needham’s Question’ of why modern science arose in Europe, not in China. In a later book, entitled *How Modern Science Comes Into the World. Four Civilizations, One 17th Century Breakthrough*, published in 2010 and equally ignored by Hart, I took up the question all over again and now sought to answer it by invoking the long-term absence in the Chinese case as compared to the threefold manifestation in its Greek counterpart of a phenomenon that I called ‘cultural transplantation’. That is, the kind of refreshment that may greatly benefit or even transform a given body of knowledge once it is being dropped into a new cultural setting happened three times to the Greek corpus of natural pursuit (transplantation to, successively, the Islamic world, medieval Europe, and Renaissance Europe) but never to its Chinese counterpart, which basically remained locked up in itself until far into the 19th century. This particular pathway toward explaining how modern science could arise in Europe rather than in China may of course be right or wrong or anything in between, but not perhaps serve as a fitting object of the kind of wholesale neglect meted out to it by Hart in spite of his fashionable, deeply uninformed railing against the very notion of the Scientific Revolution of the 17th century.

Returning now for a moment to the man who asked the Needham Question and gave it so compelling a turn as to inspire entire generations to pursue the question further, it is hardly Needham only whose work is relegated by Hart to the dustbin of teleological hagiography—*every* historian preceding Hart is. It is only in the occasional footnote that Hart briefly mentions a few historians who are implied rather than declared to be exempt, to some undefined extent, from those sins against proper history writing that Hart keeps castigating over the length and breadth of his book. It is here that we encounter the names of such seasoned experts as Karine Chemla, Catherine Jami, or Peter Engelfriet. Since the latter’s book *Euclid in China*, preceding Hart’s book by fifteen years, is easily the most comprehensive study of the subject to date, it is particularly interesting to examine how Hart deals with it. Well, he doesn’t. Why not? Because, so I cannot help thinking, if he had done so he would *ipso facto* have exposed the utter untenability of the historiographical dichotomy that lies at the heart of his own book. It is precisely the subtly contextual approach

² Needham (1970), p. 70; comp. Cohen (1994), p. 436.

consistently taken by Engelfriet that makes the latter's analyses so superior. Take the snippets of evidence about Xu that Hart has carefully selected with a view to underwriting his own portrait of Xu as a mathematical bungler ready to purloin innovative work of early Ming mathematicians to serve his own agenda. In radical contrast, Engelfriet has fifteen years earlier acquainted us with the full plethora of Xu's pertinent writings. He has made it clear over and above all else that what, for Xu and some like-minded scholars, singled out Euclid's work as compared to mathematics in the Chinese tradition rested in Euclid's axiomatic method centered on the early Greek idea of *proof*. Engelfriet has not, of course, put the singular significance of that idea forward as an in any way novel insight; novel is rather that Hart will have none of it. In order to counter the standard view of the singularity of the Euclidean-axiomatic method and the profound impression it made on Xu and some contemporaneous and later 'converts', Hart comes up with the extraordinary argument that one cannot properly speak of an axiomatic method prior to its rigorous definition by Frege and Hilbert some three centuries later. It has been some time since I came across so grossly an anachronistic argument, really teleological-in-reverse, as here put forward by Hart. And yes, such are the lengths to which he is apparently prepared to go in order to shore up a grossly untenable thesis.

This is hardly the place to delve much further into Engelfriet's truly contextual, truly historicizing study. If you *really* want to learn about 'the first encounter between China and the West', then Engelfriet's, not Hart's book is where to go. There you find set forth the prehistory of Euclid translations in Europe; the Jesuits' motives for sponsoring the joint translation of Father Clavius' version of the *Elements* into Chinese; the translation itself; what Xu admired in the Euclid approach to mathematics and how that fitted in with his own position and ambitions at the late Ming court; the varied uses the translation was put to under the Qing. While discussing all this and more, Engelfriet has also taken up the well-known question of whether or not the Chinese language even allows proper translation of typically Greek concepts like axiom, proof, or equality. Hart dedicates in his customary all-or-nothing style an entire chapter, filled with strawmen, to the question, carefully ignoring the brief, sober, sensible treatment that Engelfriet already gave it fifteen years earlier. All in all, so Engelfriet instructively concluded his own book, even though Euclid's style of proof never really caught on in 17th or 18th century China on a scale larger than with a variety of diffuse individuals, the never quite forgotten presence of the *Jihe Yuanben* did pave the way for its renewed, this time wholesale reception starting about half-way the 19th century.

References

- Cohen, H. Floris (1994), *The Scientific Revolution. A Historiographical Inquiry*, Chicago & London: University of Chicago Press.
- Cohen, H. Floris (2010), *How Modern Science Came Into the World. Four Civilizations, One 17th Century Breakthrough*, Amsterdam: Amsterdam University Press.
- Engelfriet, Peter M. (1998), *Euclid in China. The Genesis of the First Translation of Euclid's Elements Books I-VI (Jihe yuanben; Beijing, 1607) and its Reception up to 1723*, Leiden: Brill.
- Needham, Joseph (1970), *Clerks and Craftsmen in China and the West. Lectures and Addresses on the History of Science and Technology*, Cambridge: Cambridge University Press.
- Prins, Jacomien & Cohen, H. Floris (in press), "Knowing Heaven and Earth through Music," in *Cambridge History of Music in the Sixteenth Century*, Cambridge: Cambridge University Press.